DOCUMENT RESUME

ED 342 592 RC 018 582

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TITLE Computerizing Your Program.
PUB DATE Oct 91
NOTE 11p.; In: Proceedings of the International Conference and Workshop Summaries Book of the International Association for Experiential Education (19th, Lake Junaluska, NC, October 24-27, 1991); see RC 018 571.
PUB TYPE Speeches/Conference Papers (150)

EDRS PRICE MF01 Plus Postage. PC Not Available from EDRS.
DESCRIPTORS Computer Graphics; *Computer Printers; *Computer Software; Computer Software Evaluation; Costs; *Databases; *Desktop Publishing; *Spreadsheets; *Word Processing
IDENTIFIERS *Computer Selection

ABSTRACT

This paper summarizes information about using computer hardware and software to aid in making purchase decisions that are based on user needs. The two major options in hardware are IBM-compatible machines and the Apple Macintosh line. The three basic software applications include word processing, database management, and spreadsheet applications. These can be purchased in an integrated package or as separate stand-alone packages that allow for interconnections with the data. Character-based programs display only basic keyboard characters, while graphical-based programs display data graphically. Word processors are available that perform functions ranging from simple word processing to elaborate desktop publishing. Spreadsheets arrange data in a row and column format. They can be used for ledger-type calculations or for displaying text in a table format. The two basic types of databases are flat file and relational. Flat file databases are best for discrete data, while relational databases hold data in multiple, interrelated tables. Desktop publishing software allows layouts and graphics for brochures, manuals, forms, and other printed material. Desktop publishing requires a graphical user interface system and preferably a large monitor. Two basic printer fonts are bitmapped fonts and scalable fonts. Some sophisticated software features allow users to paste data from one program to another. Task switching or multitasking allows users to switch back and forth between several programs. The paper contains numerous tables containing costs and user information. (KS)

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COMPUTERIZING YOUR PROGRAM

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Introduction

It 's true that computers can make a major difference in how you run your program. Unfortunately, whoever said that getting a computer will give you more free time was not telling you the real story. Initially, you won t see much increase in productivity. It takes time to learn how to use software effectively. Once you have mastered using a computer, you will be able to speed up tasks you are doing by hand (like accounting and billing), and accomplish some tasks in house that you never could before (like desktop publishing). As you become more proficient, you will begin to see the benefits. However, don t assume you are now going to have lots of free time on your hands. In fact, becoming more proficient will lure you into doing new things on your computer so that numerous other aspects of operating your program will expand to fill all the time freed up by automating your operation.

NOTE: The software and hardware listed throughout are designed to serve as examples of packages. No endorsement of any specific item is intended or implied. We all have our own preferences for the types of software and hardware we use.

Hardware

There is a lot you can say about personal computer hardware. What you get depends on what you are planning to do with the system. The two major options are IBM compatible machines and the Apple Macintosh line. One thing is certain, as your sophistication grows, so will your need for a more powerful machine. Make sure that whatever computer you get has sufficient upgrade potential. A lot of people ask about the difference between IBM and Apple. The answer is that the difference is disappearing fast. Most major software packages have versions that run on both platforms and exchange files back and forth freely. An announcement made during the summer that IBM and Apple will be working on developing a common hardware and operating system platform suggests that the differences will continue to fade.

In general, IBM compatible machines were originally designed for character based programs (see below). With the advent of Microsoft Windows, IBM compatible machines can now operate with a graphical user interface (see below). The Apple Macintosh was designed from the start as a graphical user interface operating system. Below are some general specifications and prices for types of systems and what you can do with them.

PC (8088 processor)	$500	poor	character based programs - word processor, database, spreadsheet
XT (8086 processor)	$800	poor	same as above
AT (286 processor)	$1200	average	character based programs - word processor, database, spreadsheet, can run graphical based programs with extra memory (but slowly)
(386SX processor)	$2000	good	character based or graphical based programs - word processor, database spreadsheet, desktop publishing,

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Computer/Processor	Price	Expandability	graphics Types of software
PC (386DX processor)	$3000	excellent	same as above
PC (486 SX & DX processor)	$4000	excellent	same as above
Macintosh SE/30 16 MHz (68030 processor)	$1979	average	all graphical based - word processor, database spreadsheet, desktop publishing, graphics
Macintosh LC (16MHz 68020 processor)	$1779	good	same as above
Mac IIsi (20 MHz 68030 processor)	$2699	excellent	same as above

A basic recommendation for an expandable IBM compatible system capable of handling graphical based programs and operating environments (such as Windows 3.0) is a 386SX machine with at least a 60 megabyte hard drive, 2 to 4 megabytes of RAM, a 14 inch VGA color monitor, DOS 5.0 operating system, and a 1.44 megabyte and/or 1.2 megabyte floppy disk drive. Any of the Macintosh systems listed above are acceptable with at least 2 megabytes of RAM and a 40 to 60 megabyte hard disk. If you plan to do desktop publishing, you will probably want something other than the SE/30. The built-in monochrome monitor is fairly small.

Software

Software is what computing is all about. There are three basic software needs or applications: word processing, database, and spreadsheet. Early software utilized proprietary formats for storing data which precluded exchanging data across software packages. This also meant that data often had to be re-entered to get it into another software package. As software has evolved, the move has been toward greater integration among different software packages. This approach assumes that data are data and should be accessible from a variety of different packages. For example, payment data in a database on clients should be able to be pulled into your spreadsheet to calculate financial trends and chart those trends. These tables and charts should then be able to be placed in your word processor for an annual report. Whatever your software needs, you will eventually find that this integration will be fundamental to effectively using a computer.

For the three main applications there are two approaches: an integrated package or a number of stand-alone packages that allow for interconnections with the data. There are advantages and disadvantages to both.

	Integrated		Stand-alone
+	low cost	-	high cost
+	good data interchange	-	average data interchange
-	limited features	+	advanced features
+	ease of learning one program	-	several programs to learn
+	multiple programs available at once		

You need to decide on an approach to your computing needs based on the features you need, training time involved to learn to use the software, type of hardware you have, and cost factors. One thing you can be sure about is that integrated packages will get better and offer more features while stand-alone packages will get better at data interchange and at operating simultaneously (See Task Switching and Multi-tasking below).

A. Graphical versus Character based Programs

A character based program is one in which only the basic keyboard characters can be displayed on the screen in a mono spaced font. A graphical based program displays data and commands in a graphical format. If you specify a particular font in a character based program, you won't see any change in the mono spaced

font on your monitor (although the document will print with that different font). With a graphical based program, often referred to as a GUI (Graphical User Interface), you will see the new font displayed on your screen at a close approximation of how it will look when printed. This is often referred to as WYSIWYG (What You See Is What You Get). GUI's also utilize icons to represent files, programs, printers, etc. and allow direct manipulation of on-screen elements. For example, in a graphical word processor, you can select and drag the page margins to a new position to reformat your page rather than having to calculate and type in specific measurements. Graphical based programs must keep track of all the different objects displayed on the screen and redraw them each time you make changes. This requires much more computational power than a character based program. With a GUI, if you don't have a fast enough machine with enough memory, you will go crazy waiting for the machine to redraw after your last command.

Which is better? Ask different people and you will get different answers. To some extent the answer about what type of interface to use depends on the computer you have. As indicated above, certain IBM compatible machines simply don't have the computing power to effectively run graphical interfaces. There are some new graphical interfaces that do run very fast even on a PC class machine (Geoworks). However, there is currently not enough software available to make Geoworks a viable alternative. This may change. If you have a PC class or XT class machine, you will definitely want to use character based software. The good news is that character based programs for IBM compatible machines have been around much longer than graphical based programs. There are numerous excellent character based Big Three programs out there.

So what good is a graphical user interface? Well, one advantage is that there is consistency in menu structures among different software packages. This makes learning a new program easier. This trend is also taking place among character-based programs as more programs are being written to be Common User Access compliant (CUA), a standard using drop down menus accessible by mouse or keyboard similar to those found in graphical user interfaces.

B. Integrated Packages

There are a number of integrated packages that include basic word processors, databases, and spreadsheets. These packages allow for data from the different parts of the package to be shared (for example you can do mail merges from database to word processor). If you haven't used a computer before, these packages may be the right way to start. They are fairly easy to use and generally are available for under $200. However, with the benefits of integration you lose some sophistication of the programs. As you become more fluent in working with software you may want to move up to stand-alone programs. One thing to check when you buy an integrated package is what formats the data can be saved or exported into. For example, if information in the database can be exported or saved as ASCII files, then it can be imported into a stand-alone database. This will save you the hassle of rekeying all the data.

Package	Computer platform	Street Cost
Microsoft Works 2.0/2.0	IBM/Mac	$95/$165
PFS WindowWorks	IBM	$125
Symantec Great Works	Mac	$199

C. Word Processors

Word processors are the bread-and-butter of computing. From letters to clients, training materials, annual reports, office forms the list goes on and on. PC Magazine defines the following levels of word processing software and the features they should support.

Personal word processor - should be easy to learn and use. It is best suited for short documents, letters, and memos. Important features include context-sensitive help, simple menus, and clear documentation. The most common users are students, home users, executives, and other professionals who write short documents.

Professional word processor - is more full-featured. It should be able to handle long documents with extensive page formatting, including complex headers, footers, and indexing. Print control and dictionary support are also important, and likely users include professional and technical writers, students, and those working in the publishing industry.

Corporate word processor - should easily handle short documents, letters, and repetitive memos that are produced often, and should offer mail-merge. Document summaries (including author, revisor, keywords) and envelope printing are a must.

Word processor with desktop publishing features - must be able to handle multiple columns of text and import common graphics files as well as spreadsheet data. The program should also be a capable front end for preparing copy for a full desktop publishing program.

A more powerful word processor provides you with features including:

1. Mail merge capability - can information be imported from your database or spreadsheet directly, or do you need to export the data into one format and then import it? If you do a lot of mail merge documents, having this be easy is essential.

2. Templates - allow you to develop pages with boilerplate text such as letterhead or memos. Templates can streamline an operation when many of your documents need a particular format.

3. Styles - defining styles allows you to create a common look for headings, paragraphs, etc. across documents. Typically, a document template may have a number of styles associated with it. Styles allow you to make global changes quickly. For example, if you have defined a heading style in an article using Helvetica 12 point bold and then decide to change it to Palatino 12 point bold, all you need to do is redefine the style. All headings set in that style will automatically change. You can also define a style based on another style. Changes made to the parent style will also be reflected in the child style.

4. Tables - having a good table extension in your word processor allows you to easily group information in your document in rows and columns without using complex tab stops. Tables should be easily formatted in terms of column width, row height, and borders.

5. Outline capability - allows you to format your document in outline view and promote or demote sections to different levels in the outline. This can be a helpful organizational tool when working on longer documents.

6. Graphics Placement - can you place graphics into a document? Having this feature can allow you to generate letterhead with your logo, print newsletters, etc.

Package	Interface	Computer platform	Street Cost
MacWrite II 1.1	Graphical	Mac	$139
Microsoft Word 5.5/4.0	Character or Graphical	IBM/Mac	$209/245
Professional Write 2.2	Character	IBM	$160
Q&A Write 1.01	Character	IBM	$139
Word Perfect 5.1/2.0	Character or Graphical	IBM/Mac	$249/$279

D. Spreadsheets

Spreadsheets began as a basic ledger sheet using rows and columns. You could type text and numbers into the cells on the spreadsheet and perform calculations on the data. Today's spreadsheets allow you to do much more than just calculate this years budget.

This section of a sample budget illustrates how a spreadsheet works. A cell is the intersection of a row and a column. As you can see, both text and numbers can be typed into cells. For example, in cell C6, the number $749.00 has been entered. Calculations are performed by entering formulas in other cells. For example, cell C13 calculates the subtotal of the printing charges with the formula C6+C7+C8+C9+C10+C11 or a short cut formula SUM(C6:C11). The formula in cell D13 calculates the printing cost per participant by dividing the printing subtotal by the number of frosh participants through the formula C13/E1. If the number of participants in cell E1 is changed to 400, the entry in cell D13 will automatically be recalculated to $4.87. This automatic recalculation allows you to do extensive what if modeling with your data. In the example above, if you wanted the cost per frosh to be kept below $4.75, you could experiment with different values for printing and mailing to see how you would need to cut your costs to arrive at that goal.

So a spreadsheet can be used for a variety of ledger-type calculations. Spreadsheets can also be used for any text that needs to be displayed in a table format. The key to using a spreadsheet effectively is expanding your idea of the types of information and/or calculations that can usefully be displayed in rows and columns. One example of this is using a spreadsheet as a database. Any information entered along one row of a spreadsheet can be treated as one record in a database program. In fact, most high end spreadsheets can import or export information to a format usable by a low or high end database and vice versa. All spreadsheets have some charting capability that allows you to select rows and columns of numbers and plot a chart of the data. Below is a sample spreadsheet with rows corresponding to trip participation. A range of data is defined from cell A18 through cell C23. This data set is then charted as seen below.

Package	Interface	Computer platform	Street Cost
Lotus 123 2.3/3.1	Character or Graphical	IBM	$339/$405
Microsoft Excel 3.0	Character or Graphical	IBM/Mac	$309/$309
WingZ 1.1	Graphical	IBM/Mac	$319/$245

E. Databases

There are two basic types of databases, flat file and relational. A flat file database works much like individual pieces of paper in a file cabinet. All of the data goes into a single table made up of a number of fields. Each row in the table corresponds to a particular record (or piece of paper in the file cabinet analogy). All of the data is physically linked. For example a table view of an Accident Database for an outdoor program might look something like this:

Incident Number	Injury/Illness	Date	Location	State
91001	ankle sprain	9/27/91	Wind Gap	PA
91002	laceration	10/14/91	Pine Barrens	NJ
91003	infected blister	11/4/91	Catskills	NY

The field names are at the top of each column and each row is an individual record. Usually data is entered through a data form which corresponds to a single record. A blank data form for the Accident Database would look like the following:

Flat file databases are best for discrete data, that is, information for which there is only one record for each event. Flat file databases also allow you to perform calculations and basic analytical functions (such as count, total, subtotal, average, maximum, and minimum) on fields in the database.

A relational database typically holds data in multiple, interrelated tables. Data is connected not physically, by being part of the same table, but logically. The logical connection between two different tables is a field that both tables have in common. An example of a relational database is the Trip Database shown below. In this case, there are four separate tables with related information all linked by the trip number field.

Table 1

Trip Number	Trip Location
001	Water Gap
002	Pine Barrens
003	Smokies
004	Black Forest

Table 2

Trip Number	Participants
001	Mary Smith
	Jack Jones
	Jim Arnold
	Rebecca Franks

Table 3

Trip Number	Trip Leaders
001	Sarah Miller
	Al Bates
002	Sarah Miller
	Becky Johnson

Table 4

Trip Number	Income
001	$752.00
002	$27.50
003	$325.91

In this example, you can enter your information for each trip once and then call up a report of all trip participants for Trip 001, or you could ask for all of the trips led by Sarah Miller. The relational database does the work of collecting the requested data from across the tables. A flat file database would require you to have a field for Participant1, Participant2, Leader1, Leader2, etc. A relational database is particularly useful when repetitive data would need to be entered in different tables.

Flat file databases often have look-up capabilities which means that by using a unique value in a common field between two tables you can look up data in one table and import it into the other. In this way, a flat file database can imitate some of the functionality of a relational database. For example, suppose you had a large mailing list database that included employees as well as people outside your company and a smaller employee database with personnel information. Using the social security number as the unique field value in both databases, you could program your flat file employee list database to look up the address of an individual from your overall mailing list. This means that you only need to maintain the correct address in the mailing list database.

In both flat file and relational databases, one of the most critical aspects is reporting. Besides just holding your information, you want to be able to look at it through what is known as a query to find information, trends, etc. A typical query might be how many staff have current EMT certification or what percentage of our participants were from New Jersey? Your database should have solid reporting capabilities in which reports are easy to define and frequently used report specs can be saved for future reference. The combination of reporting and mathematical calculations allows you to use either type of database for calculating and entering bills and invoices.

Which is better, flat file or relational? This depends on your particular needs. In many cases a flat file database will be sufficient for data like mailing lists, employee records, etc. items that are discrete data parcels. The advantage to flat file databases is that they are generally inexpensive and fairly easy to learn. Relational databases are best if you have more complicated interrelated data that needs to be kept and/or if you need to perform more complex statistical analysis on your data. Relational databases are far more powerful than flat file databases and many allow you to customize the program interface specifically for your needs. With this power comes a steeper learning curve and higher price. As you look for a database also think about how it will interface with your other programs, including your word processor and spreadsheet. Can you do mail merges from the database into the word processor? Can you export database

information into your spreadsheet for more involved calculations, and can you import spreadsheet data into your database?

Package	Interface	Type	Computer platform	Street Cost
DBase IV	Character	relational	IBM	$485
FileMaker Pro	Graphical	flat	Mac	$215
Foxbase+/Mac	Graphical	relational	Mac	$295
Paradox	Character	relational	IBM	$505
Q&A	Character	flat	IBM	$255

F. Desktop Publishing

Desktop publishing software has opened up a new world of opportunities for producing high quality brochures, manuals, advertising, forms, and reports in-house. Previously, you probably wrote the copy and sent it out to an outside firm to do the layout and graphics. This meant lots of extra cost and you had to get the material to them way ahead of time. Making last minutes changes was often impossible or very expensive. With a good desktop publishing program (DTP) you can do the copy in your word processor, import it into your DTP, and do your own layout with fonts and graphics. The basic metaphor in DTP is often a pasteboard. Like traditional methods of layout, you design the basic look of your publication and import the text and any graphics or photos. Once all the elements are in your publication, you can modify it by moving elements around, changing fonts, etc. You can set up the publication to run as one column or multiple columns like a magazine or newspaper.

A word of warning about DTP. This software offers you an amazing array of layout options, some of which will look good and some of which will look terrible. You don't have to be a graphic designer to use DTP, but you do need to become familiar with basic layout principles. Your final goal is to present your information effectively. If your layout is poor, your message wont get across, in fact, it could lose your audience. There are a number of good books on specific DTP software packages that also cover basic design principles. Doing DTP in-house can definitely save you time and money in the long run. In the short run it will take you some time to master the program because of its power. For occasional newsletters or reports there are a number of low end programs that function well. Another option is to use a high end word processor. As described above, a number of word processors will handle basic DTP functions such as multiple columns of text, graphics importing etc. If you will be doing regular, work such as a monthly newsletter, catalogs, or long book-type documents, you will be happier working with a higher end DTP program rather than a word processor or low end DTP package. The extra sophistication of high end programs more than makes up for the extra cost.

Package	Interface	Computer platform	Street Cost
Aldus PageMaker 4.0/4.01	Graphical	IBM/Mac	$489/$499
Publish-It! 2.0	Graphical	IBM	$135
Quark Express 3.0	Graphical	Mac	$519
Springboard Publisher II	Graphical	Mac	$109
Ventura Publisher	Graphical	IBM/Mac	$529

Hardware Requirements for DTP

When you talk about DTP, you need a graphical user interface system (either Windows 3.x for the IBM compatible or any Macintosh System), which means a machine with some speed (386 SX, the Mac LC, or any of the Mac II systems, as a minimum, if you will use it often). Another issue is monitor size. Staring at a 12" or smaller screen means seeing only a small portion of your page at a time. Although all the programs let you zoom in and out, you will quickly tire of trying to work with such a small image of your page. A larger monitor will help (14" or, better yet, a 16"). However, monitor size is just part of the

picture. You also can purchase a monitor capable of displaying higher resolutions matched with a video card that can output higher resolution. The higher the resolution, the greater the number of pixels displayed on the screen, which means you can see more of the page you are working on. A 16" monitor with a video card operating at 1024 x 768 non-interlaced resolution is a good setup on an IBM compatible.

Monitor & Video Card	Computer platform	Resolution
VGA	IBM	640 x 480 pixels
Super VGA	IBM	800 x 600 pixels
8514	IBM	1024 x 768 pixels

Besides monitor and video card, the other major item is a printer. If you are going with a DTP, you obviously want quality output. This usually means having a decent printer either a laser printer or an ink jet printer, generally operating at 300 DPI (dots per inch). Both have some built-in fonts and are capable of accepting downloaded fonts as well. Most dot matrix printers don't have the built-in font capabilities for good desktop publishing. Although some add-on font packages, such as Adobe Type Manager or Bitstream Facelift, will generate outline fonts on dot matrix printers (see below). So let's take a brief journey into printers and fonts.

Printers and Fonts

There are two basic types of fonts, bitmapped fonts and scalable fonts. A bitmap font is an image of a particular character made up of pixels, individual dots produced by your printer or shown on your monitor. Laser printers such as the Hewlett Packard Laserjet II have only a few bitmapped fonts built in or accessible through cartridges, there by limiting your design options. You can purchase software bitmapped fonts that are stored on your hard disk and can be downloaded to your printer. The only disadvantage with bitmapped soft fonts is that each letter of a certain point size (8, 10, 12 etc.) must have an image on disk. This means you must have already installed that size font on your hard disk and bitmapped fonts can take up lots of disk space. Also, using lots of soft fonts can increase printing time because the font needs to be downloaded to the printer. Complex documents with lots of fonts may require additional memory in your printer.

Scalable or outline fonts use a different approach. An outline font is a mathematical representation of the various lines and curves associated with each character. The printer can expand or contract this one mathematical representation to create fonts from small sizes (e.g. 4 points) up to large sizes (e.g. 120 points). Outline fonts give you much more freedom in designing a publication, since you can change the size of a font in your document without having to install that size bitmapped font on your hard disk. You can also purchase software outline fonts to install on your hard disk. These fonts are also downloaded to your printer but take up much less disk space than bitmapped fonts. Font managers such as Adobe Type Manager and Bitstream Facelift can be loaded into memory while you run another program. The font manager has a number of outline fonts stored on disk that it can scale "on the fly" for display on your screen and/or to be downloaded to your printer.

If you only need a few fonts, you may be fine with a generic laser printer and its built-in fonts, with a few software fonts. If you are doing more complicated projects, you will ultimately want to go with a printer with a page description language (PDL). A PDL is a special graphics language built into the printer that supports not only scalable fonts but a variety of other graphics features, such as shading, fills, and text rotation. The two major PDLs are Postscript, developed by Adobe Systems, and PCL-5, developed by Hewlett Packard. PCL-5 is specifically designed for laser printers operating at low resolution (300 DPI). Postscript is a device independent language which means that it will print at whatever resolution the printer utilizes, anywhere from 300 - 3000 DPI. The cost for printers with a built-in PDL is obviously higher. There are, however, some intermediate paths. For example, you can buy a base level Hewlett Packard or compatible laser printer and use a font manager with software outline fonts, or you can upgrade your printer by adding a plug-in Postscript cartridge and additional memory.

Printer Package	Printer Language	Computer platform	Street Cost
Hewlett Packard Inkjet		IBM/Mac	$525
Hewlett Packard Laserjet IIP	PCL-4	IBM/Mac	$840
Hewlett Packard Laserjet IIIP	PCL-5	IBM/Mac	$1050
Hewlett Packard Laserjet III	PCL-5	IBM/Mac	$1599
QMS PS-815	Postscript	IBM/Mac	$3599
QMS PS-410	Postscript	IBM/Mac	$1859

What if you don't have a printer? You can take your file to a Service Bureau and they can print it out for you either on a 300 DPI laser printer or on a high resolution imagesetter (1200 - 2500 DPI). This is generally fine if you only need to print a few documents a year that require page description language support. If you print a lot, you will soon tire of driving over to the Service Bureau and paying anywhere from $5.00 - $10.00 a page. An intermediate step is that some copy centers have computers with DTP software and printers that you can use for page layout and printing. In the long run you are probably best served by having a printer in your office. Save the Service Bureau for those documents that need to be printed at high resolution, like magazine ad copy or a capital campaign prospectus.

G. Other High End Software Features

Dynamic Data Exchange (DDE) or Publish/Subscribe - this feature allows you to generate data in one program and paste a linked copy of it into another. If the data in the first program changes, it will automatically be updated in the second program. For example, say you are working on an end-of-the-year report in your word processor. You have data on participation in Wilderness Orientation programs over the past 5 years from your spreadsheet. If you paste the data into your word processing document with DDE, and later you make changes in the spreadsheet, the data in the word processing document will automatically be updated the next time you open the document. This same feature is available as Publish/Subscribe in System 7 on the Macintosh.

Object Linking Environment (OLE) - This feature takes DDE one step further. If you have two software packages that are OLE-aware, and you paste data from the first into the second, then by selecting the pasted data you will open the application that it originated in and you can make changes to it. For example, if you are working in a DTP program and have pasted in a graphic that you drew in another program, you can start the graphics program and open the original graphics file by selecting the graphic from within the DTP program. Then you can make changes and exit the graphics program and the changes will automatically be made in the pasted copy in the DTP document.

Task Switching vs. Multitasking - One of the advantages of an integrated software package (see above) is that you can run your word processor, spreadsheet, and database at the same time and move information back and forth between them. This is accomplished through a process known as task switching, where one program is temporarily halted as you switch to the other. When you complete your operations in the second program and return to the first, you are back where you started from. Stand alone software packages can be augmented with task switching software that allow you to do the same thing. On the Mac, operating systems prior to System 7 accomplished this through what is known as the MultiFinder. Multitasking is the ability of the computer to run several stand alone programs simultaneously while keeping the different programs and their data separate in memory. So you can begin an operation in your spreadsheet and, while it is performing calculations in the background, you can switch to your word processor and work on a document. This allows you to switch back and forth between programs without interrupting their operation. True multitasking can dramatically increase productivity on a computer by allowing your access to multiple programs simultaneously. You no longer have to stop what you are doing in one program, save it, exit the program, start the other program, retrieve the data, exit, restart your first program, and open the document. Advanced operating systems or environments such as System 7 on the Mac or Windows 3.0 running on a 386 machine allow for true multitasking. Multitasking allows you to hop back and forth between different tasks, which is the way most people work.

References

Carr, Brian. (1990). 386 *Multitasking Environments*. PC Magazine, October 16.

Dickinson, John. (1990). *Graphical Word Processors*. PC Magazine, July.

Flynn, Mary Katherine, & Kane, Robert. (1990). Super VGA Boards. *PC Magazine*, September 24.

Greenberg, Stuart R., & Rosch,Winn L. (1990). 1024 Graphics Adapters. *PC Magazine*, April 10.

Kalman, David. (1991). Relational Databases. *PC Magazine*, May 28.

Lininger, Skye. (1991). Word Processors Can Publish, too. *Personal Publishing*, October.

Mendelson, Edward. (1991). Scalable Fonts for the PC. *PC Magazine*, September 24.

Mendelson, Edward. (1991). Type Faces Unlimited. *PC Magazine*, April 16.

Mendelson, Ed. (1990). Word Processors. *PC Magazine*, December 11.

Perratore, Ed. (1991). Integrated Software. *PC Magazine*, August.

Poor, Alfred. (1990). 1024 Monitors. *PC Magazine*, September 24.

Poor, Alfred. (1991). Sixteen Inch Monitors. *PC Magazine*, March 26.

Rosch, Winn L. (1991). SVGA Monitors. *PC Magazine*, July.

Rosch, Winn L. (1990). 1024 Display Systems. *PC Magazine*, April 10.

Seymour, Jim. (1989). The GUI: An Interface You Won't Outgrow. *PC Magazine*. September 12.

Simone, Luisa. (1990). Self-sufficient Desktop Publishing. *PC Magazine*, February 27.

Stinson, Craig. (1990). Spreadsheet Heavyweights Take on 1-2-3. *PC Magazine*, April 24.

Stinson, Craig. (1990). Who Needs a Graphics Package Anyway? *PC Magazine*, December 11.

SOURCES FOR INFORMATION

PC Magazine, Ziff Davis Publishing, New York, N.Y.
MacUser, Ziff Davis Publishing, New York, N.Y.